

The Quantum Model of the Atom Summary

A. The Nature of Electrons

1. The amount of energy an electron has determines its distance from the nucleus
2. Electrons can have only certain amounts of energy (quanta)
3. This means that electrons orbit at certain levels away from the nucleus

B. Energy Levels

1. There are maximum of 7 energy levels
2. The maximum number of electrons that can exist in an energy level is $2n^2$ (where n is the number of the energy level)

C. Orbitals in an energy level

1. Each energy level has a number of orbitals
2. There are only 4 basic orbitals; the orbitals are named s, p, d, and f

D. Orbitals

1. Each orbital can contain a certain number of electron routes/paths

Orbitals	# of "paths"
s	1
p	3
d	5
f	7

2. Each suborbital path can hold two electrons, any one s-orbital can hold only 2 electrons.
3. Each path within an orbital must receive one electron before any of them receive two electrons

E. Electron Configuration

1. An electron configuration is a chemist's shorthand way of showing how many electrons an atom has in each of its sublevels
2. Filling order - the Aufbau Diagram

1s

2s	2p						
	3s	3p	3d				
		4s	4p	4d	4f		
			5s	5p	5d	5f	
				6s	6p	6d	
					7s		

- a. Start at the upper left
- b. Fill the orbitals and sublevels as you move down the column
- c. When you reach the bottom of a column, move to the top of the next column to the right and continue

3. Periodic Table method

F. Orbital Notation

1. Boxes or circles are used to represent the orbitals grouped within a sublevel
2. Arrows pointing up or down are used to represent the individual electrons within the orbitals
3. Every orbital within a sublevel must contain one electron before any can have two electrons
4. The second electron to be placed in an orbital must have opposite spin and be drawn oppositely as the first electron

G. Electron Dot Diagrams

1. An electron dot diagram shows the symbol of the element and uses dots to represent only the outer shell electrons (valence electrons)
2. The s orbital electrons go above the symbol
3. The three p orbitals are positioned on the right, bottom, and left of the symbol (in that order)

H. Shorthand Method

1. Used for large atoms
2. First put the symbol for the noble gas element just before the element in question
3. Put square brackets around the noble gas symbol
4. Finish the configuration and/or orbital diagram